Research Proposal Form of the Thesis Entitled

Evaluation of Mastoid Process for Gender Determination in Patna Population using CBCT- A Retrospective Study

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By

Dr. Amit Kumar Singh
Research Scholar
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Karnavati School of Dentistry

Under the Guidance

Of

Guide: Dr. Dipti Shah
Professor
Department of Prosthodontics and Crown & Bridge

&

Co-Guide: Dr.Kalpesh Vaishnav
Professor & HOD
Department of Prosthodontics and Crown & Bridge
Karnavati School of Dentistry

Submitted

to

KARNAVATI
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INTRODUCTION

In Forensic study, distinguishing proof of sexual orientation by analysis of whole body has been utilized broadly. The mastoid process is favored for sex recognizable proof since it can frequently survive all conceivable circumstances that can cause skeletal fragmentation[1,2].

The important four signs of human distinguishing proof are age, gender, built and race. Sex recognition of the dead & decomposed body is generally used in mass disasters or in investigations for social, devout, medico-legal purposes [3].

Sex is best evaluated from the pelvis but it is exceptionally frequently harmed[4], mostly it is the cranium which is still mostly used for sex determination because all the other human bones shows different results when it comes to sexual variability. Craniofacial structures like supraorbital edges, mastoid, cheek bones, and mandible have also been used previously. In terms of quality of noticeable quality of these characters, the female cranium slants on lower values compared to those illustrated by male cranium[5,6,7,8,9]. In such cases mastoid plays a vital part in deciding the sexual orientation of an individual[10].

The mastoid process is a conical projection from the under surface of mastoid portion of temporal bone, located just behind the external acoustic meatus and lateral to the styloid process[11]. Due to its anatomical position, which make it secure to any trauma and remains admission in fact in antiquated age. The incorporation of greater muscle on male's mastoid process makes it more solid than the female's mastoid handle. Based on these contrasts, mastoid handle could be considered as one of the preeminent dimorphic characteristics[12].

On the basis of these differences, mastoid process could be considered for sexual determination cases.

Demonstration for sexual determination of morphological characters of mastoid process have been showed up by past researchers conducted on skulls and 3D replicated head models generated from computed tomography (CT) images. As compared to CT, Cone Beam computed tomography (CBCT) offers more promising outcomes due to high spatial resolution, low radiation dose, short exposure time[13-14].

In this way, the present study was planned to assess the parameters of mastoid process by CBCT in gender determination of the subjects.

STATEMENT OF PROBLEM

It has been observed that in cases of mass destruction or war it’s difficult to identify the gender of dead bodies, mastoid region is more advantageous for gender determination due to its

anatomically protected position in the skull, which makes it tough & can withstand all types of wear tears without damage.

CLINICAL IMPLICATION OF THE STUDY

Previous studies have shown that sexual dimorphism using pelvis and skull have been used by many authors. The accuracy of gender identification depends upon completeness of the skeleton, among all other bones of skull mastoid process is selected because the solid composition of petrous part & its safe anatomical location, the mastoid process doesn't get destroyed easily.

AIM

- To evaluate the dimensions of mastoid process for gender determination using CBCT in Bihar Population.

OBJECTIVES

- To measure and compare the greatest height of left and right side of mastoid among male & female genders.
- To measure and compare the greatest width of left and right side of mastoid among male & female genders.
- To measure and compare the greatest length of left and right side of mastoid among male & female he genders.
- To measure and compare the greatest inter-mastoid distance among male & female gender.

HYPOTHESIS

Proposed Hypothesis

- The dimensions of mastoid process including height, width, length & inter-mastoid distance are different in male & female respectively.

Null Hypothesis

- There will be no difference in the measurements of mastoid process in either of genders.

REVIEW OF LITERATURE

Suazo I (2008)[9]: conducted a study to evaluate the presence of sexual diversity within the measurements and to calculate the area of the mastoid triangle utilizing measurable and distinguishable work examination. For the study author included 81 skulls of Brazilian people with known sex and ages: 50 males and 31females of 40 and 70 years old. Through his study the author concluded that investigation of sex are based on the measurements of the mastoid triangle are less in females but are not significant, thus being of less utility in sex determination.

Saini V et al (2012)[11]: conducted a study to create a particular population, diversified gender anthropometric parameters for the mastoid process of Indian skulls (north). For the study, 8 specific measures of the mastoid process were evaluated on 138 grown-up skull (22–65 yrs) and analyzed it. He found out that all parameters appeared noteworthy in sexual dimorphism.

Manoonpol C et al (2012)[4]: conducted a study on 100 skulls of Thais from the central region of Thailand, (60 men and 40 ladies). The evaluation of mastoid process was recorded between the 3 anatomical landmarks. According to the author, average of mastoid measurements and mastoid triangular region in men were higher than ladies group. The author also concluded that through mastoid measurement of mastoid process sex determination can be easily achieved.

Amin W et al (2014)[6]: conducted a research to create a sex determination method for youths of Jordanian grown-up population utilizing its osteometric information, from cephalometric images, and discriminate work investigation. For his study, 146 haphazardly chosen computerized sidelong cephalometric radiographs of completely dentate youthful grown-up patients were chosen for the research; 47 subjects were men and 99 subjects were ladies. For every horizontal lateral radiographs 19 facial skeletal points of interest were assessed utilizing Computer program subroutines. The research concluded that Mastoid process was found to be the most excellent single clue of sexual orientation and can give a precision rate of 82.2%.

Yilmaz MT et al (2015)[12]: conducted a study to measure the connections of the hard tissue projections on horizontal plane of mastoid process (MP) and also to consider significance of sexual diversity in terms of mastoid triangle. The research was performed on 140 (70 ladies, 70 men) MCT images of Necmettin Erbakan College. According to the author the measurements proves that all bilateral evaluations of the men were found to be increased than females bilateral part. Furthermore, all other right bilateral evaluations were same in both the sexes.

Allam Fafab (2016)[13]: conducted a study on previously scanned MDCT images to determine gender by evaluating the mastoid process of grown up skulls individuals. Eighty grown-up patients (40 men and 40 ladies) of the Egyptian people were chosen for the study. In his research he found out that all mastoid measurements of mastoid process were larger in men than in ladies.

Poonia S et al (2016)[10]: conducted a study to evaluate the variation of mastoid quantitative analysis between men and ladies skeleton for gender determination.. For this study, 40 adult human skulls of ideal condition aged between 18-25 yrs of specified gender were chosen for the study in which suture had to be of particular pattern. Vernier Caliper was utilized for estimations of Mastoid process. He also concluded that Mastoid extent was altogether bigger in men of bilateral sides.

Gaayathri D et al (2017)[14]: conducted a study to survey the part of mastoid complex in sexual orientation by calculating its measurements in a previously scanned computed tomographic (CT) images. 100 CT images was selected & measured. He concluded that measurements of mastoids process of men were found to be on higher side comfortably than ladies.

Chaudhary RK et al (2019)[2]: conducted a research for the presence of sexual diversity within measurements of mastoid complex among Northern region of Indian population. For their study they choose 70 adults north Indians skulls & their extent, width and A-P breadth of bilateral sides of mastoid process and their mastoid complex was measured. The mastoid measurement was found to be altogether diverse in male & female with no significant difference.

Manivannan A et al (2019)[1]: conducted a study on 100 grown-up CBCT (Cone Bar Computed Tomography) images (50 male and 50 females). Their right & left clear images were selected with their radiographic length, width and height of mastoids process were calculated to determine the gender of the subjects. This study confirmed a vital difference between mastoid process of male and females. This research also confirmed of mastoid complex being utilized as a strong pointer for sex affirmation.

Bernard KA et al (2019)[5]: conducted a research to investigate both ideal subjective and non-ideal calculation of dimensions of bilateral mastoid process. For measurements compilation to characterize the mastoid complex were recorded for 100 men and 100 ladies of grown-up skulls. His study confirmed that a quantitative approach gives more prominent consistency in recognizable determination of gender than the subjective characterization of the mastoid process.

Okumuş O (2021)[8]: conducted a study to look at the possibility of age and sex determination utilizing both mastoid breadth with CBCT. In his research he chose 100 ladies and 100 men subjects of 18-83 years & measured bimastoid breadth. Through his research he concluded that bimastoid breadth in men cases was higher than that in ladies cases.

Salemi F et al (2021)[7]: conducted a study about to measure parameters, convexity and inside points of the mastoid process to determine sex determination in Iranian populace. In his study 190 (CBCT) images of 105 ladies and 85 men were selected. Through CBCT particular calculations were done on both right & left mastoid process keeping in mind the anatomical landmarks. Among the measured factors the landmarks had the foremost impact on sex determination. Author too concluded that measurements of the mastoid complex could be an exceptionally great strategy for gender determination with high accuracy of 90%.

Mondal B et al (2022)[3]: conducted a study of 60 CBCT scanned skull pictures (30 men and 30 ladies) of anticipated gender inside the age of 17–65 years, to estimate the convenience of morphometric and volumetric investigation of the mastoid process for sex determination. For this their radiographic estimations of extent, breadth, height and volume of the each mastoid complex were utilized using particular computer program. Within the research it was found that all the above selected parameters were found to be higher in men. The study concluded that stature of the mastoid process was found to be a great marker of sex assurance.

METHODOLOGY

Source of data

This retrospective study consists of previously scanned DICOM images retrieved from CBCT machine available in the system. The scans were obtained using ICAT 17-19 cone beam 3D imaging machine operating at 120kvp, 5mAs and exposure time of 26.9 seconds with 0.25mm voxel size using DICOM Image Viewer (PLANMECA Romexis Viewer, version 3.8.0R).

Method of collection of data sample size:

The retrospective study will include 100 adult CBCT previously scanned images of mastoid process, comprising of 50 males and 50 females including bilateral side of mastoid process.

Ethical Committee clearance will be obtained for the study.

Measurement parameters for the mastoid process will be as:

Morphometric measurements - Mastoid length, Mastoid height, Mastoid width & Bimastoid diameter.

Frankfort horizontal plane will be used as the standard plane of reference.

Length: it is calculated from the last end of mastoidea to the mastoidale (Sagittal view).

Height: it is calculated by pointing a perpendicular line from the mid point of length to the tip of the mastoid process (Sagittal view).

Width: it is measured from the most centric point on the lateral and medial aspect of mastoid (Axial view).

Bimastoid diameter: it is defined as the distance between the two apical points of the mastoid process (Coronal view).

INCLUSION CRITERIA:

- Scans within age range of 18years to 60 years of both males and females will be included.
- Only high quality CBCT images of right and left mastoid process will be included.

EXCLUSION CRITERIA

- Image with major artifacts.
- Images not showing any anatomical parts of the mastoid process.
- Radiologic evidence of any type of skull fracture.
- Radiologic evidence of any developmental anomalies.

Data analysis

Statistical analysis will be done using SPSS software version16. Statistical test will be done after collection of data using unpaired t test and chi square test. Inter and intra observer agreements will be evaluated by kappa test (k).

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Amit Kumar Singh

Signature of Research Scholar **Signature of Guide** **Signature of Co-Guide**